

finger, no traces of cervix or os uteri could be discovered; it seemed to terminate in a cul-de-sac. At the extremity of the passage, a firm roundish substance, of the size of a small walnut, could be felt through the lining mucous membrane: it was perceptible also by examination from the rectum. This was probably a rudimentary uterus. M. Rayer and Velpeau fully satisfied themselves of the accuracy of these statements. The woman was never married, but she had been cohabiting with a man, and appeared to have the ordinary sexual feelings.\*

The foregoing are the most remarkable and interesting cases of this kind that have been published. Others are recorded by Engel, Bousquet, Theden, Kliintosch, Boyer, Meyer and Walther; several are referred to in Voigtel's Manual of Pathological Anatomy; and there are some, perhaps, reported by other writers which I have not seen, or cannot now recollect.† The instances which I have detailed are sufficiently numerous, and afford an ample demonstration of the effects upon the female economy of this unusual departure from the common arrangement of the system.

Since the preceding pages were written, I have learned from a friend, that an instance of malformation, extremely similar to the one recounted in the beginning of this paper, has very recently fallen under the observation of an eminent physician of Philadelphia. Whether this gentleman, who has obliged and benefited the medical public, by his valuable writings on more important subjects, designs to favor the profession with an account of this case, and with his opinions respecting it, I have not been informed.

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ART. IV.—*On the Immovable Apparatus, and its therapeutic application to various Surgical diseases.* By WILLIAM HOLME VAN BUREN, M. D.

IN the treatment of disease, perfect rest and quietude are among the most effectual means of ensuring its favourable termination: hence its importance in fevers, all internal inflammations, and nervous maladies. In many local affections its application is also indispensably necessary to effect a cure, and in others it forms a very valuable adjuvant.

The possibility of rendering a diseased part of the body immovable, and the invention of an apparatus by which the physician may have it in his power to fulfil this important therapeutic indication with readiness and facility, has always been a desideratum in medical practice. In general diseases

\* *La Lancette Française*, Mars, 1839.

† [Two cases have recently been recorded by Prof. Burggraeve of Gand. A notice of them, and of some others, will be found in the Summary of this Number, under the head of Anatomy and Physiology.—Ed.]

in which rest is requisite, the quietude attendant on confinement to bed, is mostly sufficient; therefore it is principally in local affections, that it becomes desirable to produce immobility by means of an apparatus. It is consequently indispensable to the perfect consolidation of all fractures;—to the retention of luxated joints in their natural position, after reduction has been effected;—it is necessary to the union of all solutions of continuity, and to the favorable termination of diseases of the joints, whether acute, or chronic. United with compression, and support of the part, it constitutes one of the most powerful resources which we possess in the treatment of articular effusions, and affections of the joints dependent on a scrofulous diathesis.—The expedient earliest adopted, and that in most general use at the present day for the purpose of procuring perfect rest of a part combined with compression and support, is the application of splints and bandages. The qualities necessary to be possessed by good splints, and the directions for their application have been detailed, and indefinitely varied by numerous surgical authors among whom none is higher authority than the celebrated Pott. *Bandages* have been in use from the earliest ages, and their application is now called for every day in surgical practice for the purposes of compression, support and the dressings of ulcers and wounds whether caused by accident—or the results of surgical operations. These have been combined in a thousand different ways, and have served as the materials for numerous different kinds of apparatus, devised for the purpose of fulfilling the indications offered by different cases. The object which the ingenuity of the surgeon and of the mechanic has thus endeavoured to attain in these various changes, is to obviate the bad qualities inherent in all machines composed entirely of splints and bandages, and to supply their deficiencies. The following are some of these inconveniences:—the patient is long confined to his bed; he becomes extremely fatigued by the position which he is compelled to sustain; the digestive and other functions become impaired; and the general health frequently suffers to a great degree. To obviate these difficulties, machines have been invented; of these but one, that has come into use, answers at all the purpose for which it was intended; I refer to that of Amesbury, and its modifications. Besides the confinement and its consequences, there are many other objections to be urged against the use of bandages and splints, and their substitutes heretofore employed:—the complicated nature of most of these machines;—the want of facility, with which they may be obtained;—their weight, clumsiness, and the inconveniences to which the patient is subjected by their easy derangement;—the abrasion and consequent ulceration, to which parts are liable from their friction;—the necessity of their repeated renewal for the inspection of the part; or for the readjustment of the apparatus, which frequently becomes necessary from obvious causes. With regard to their efficacy in maintaining a state of immobility, we have the following decisive opinion of Boyer, than whom no one has ever had a better opportunity of judging: “*Malgre l’opinion*

généralement adoptée, il est facile de démontrer, que les bandages ne servent que très peu, ou même point, à maintenir les fragmens dans leur rapport naturel.”\*

The following remarks are however still more pertinent and from even higher authority than Boyer: “Nam neque in quiete, ut putant, crus continent, neque dum reliquum corpus in hanc vel illam partem convertitur, canales prohibent quominus crus sequatur, nisi, homo ipse diligenter advertat.”†

Among the most useful machines which have been devised as substitutes for the bandages and splints, may be mentioned that of McIntyre, which is constructed so as to open and allow its removal, and at the same time when closed to remain accurately adjusted to the limb;—the apparatus of Mr. Greenough for fractures of the lower extremities, attains the same end, and, in addition, entirely supports the limb in an iron frame work; the apparatus of Desault for fractures of the thigh, as modified by Physick and by Hartshorne, is now only rivalled in the generality of its employment by the inclined planes of Marsinna. To prevent motion of the patient's body, which the common machines will not allow without derangement, Mr. Earle invented his very useful fracture bed, of which the French possess several modifications.

These inventions, although the most ingenious of their kind, are still liable to many of the objections before mentioned; their complexity, expense, and limited application, still remain to prevent their general use.—Thus has the ingenuity of the profession ever been taxed for the perfection of this most important surgical apparatus; and this perfection has not as yet been attained, except in particular instances. The great desideratum—the object requisite to the accomplishment of all the indications presented to the physician in cases where perfect rest and immobility (combined or not, as it may be with compression and support) are necessary, has been the discovery of a substance with which a bandage may be impregnated, allowing its application with readiness and facility, and immediately afterwards becoming perfectly firm and hard, so as to supply the place of splints, in the support of a part.

It is not only of late years that the attention of the profession has been directed to this subject. We have evidence that the Arabians, and some of the Eastern nations, were in possession of an immovable apparatus, which they were in the habit of applying to the treatment of fractures. It is generally believed that the idea was first suggested, in modern times, to M. Geoffroy, on the inspection of some ancient Egyptian relics. M. Sedillot,‡ in the early part of the past year, exhibited before the Royal Academy of Medicine of Paris, an apparatus made use of by the Arabians for fracture of the fore-arm; it consisted of numerous divided splints, each but an inch

\* Dictionnaire des Sciences Médicales, tome xvi, p. 535.

† Hippocrates, De Fracturis.

‡ Archives Médicales, Paris, Fevrier, 1839.

wide made of cane; these were firmly attached to a sheepskin, by means of which they were applied to the arm. Of this the splint recommended by Benjamin Bell\* is but a modification; it consists of a thin strip of wood glued on leather and afterwards split longitudinally so as to be rendered flexible. A splint consisting of strips of whalebone attached by linen after the manner of women's stays and formerly much used by the English surgeons, is also on the same principle.—This expedient calls to mind the injunctions of Ambrose Paré, when suffering from a fractured leg to his friend, Richard Hubert who was attending him: "You must fortifie" said he, "the sides of my limb with junk made of tents or little sticks, and lined with linen cloth."† Both Fabricus Hildanus, and Heister recommend leather stockings rendered inflexible by brass rods to be used in certain cases of fracture. The modern Greeks, according to the statement of M. De Bougueville,‡ have long been in the habit of using a consolidating mixture, in their treatment of fractures; gum mastic is said to form its principal ingredient. A similar, though essentially different expedient is adopted in Spain, Corsica and the Brazils, introduced most probably, at first, by the African Moors.

The Italians have long made use of an immovable apparatus, which has been brought into notice by Assalini, in the modifications which he applied to it—consisting chiefly in the substitution of moistened paste-board for the original materials. The itinerant bone-setters of Switzerland, and the southern and western provinces of France, some of whom have become quite notorious on account of their success in the treatment of fractures, sprains, &c., employ paste-board, and willow splints; and solidify their apparatus by means of resin, pitch, mastic and other varnishes. Guy de Chauliac, one of the earliest writers on surgery in France, speaks of a composition which he employed, consisting of slacked lime, with different gummy and resinous substances. Ambrose Paré also recommends at length the following "plaster to hold fast restored bones:—℞. Thuris, mastich, aloës, boli armenii, ana ʒj; Aluminis roch, resinæ pini siccæ subtilissime pulv. ana ʒiij; Farinæ ʒjss; Album ovorum q. s.—make thereof a medicine, and let it be applied all around the leg."§

Among the English authors on surgical subjects, Cheselden,|| is the first who makes mention of our apparatus; in his "Anatomy" he speaks of a bone-setter of Leicester, who employed a mixture of wheat flour, with the whites of eggs, with which he smeared his bandages in order to render them solid; subsequently he adds:—"I think there is no better way than this to treat fractures, for it maintains so perfectly the position of the limb."¶

\* Bell's Surgery, Phil. Ed. 1814, Appendix, p. 15.

† "The works of that famous chirurgion Ambrose Paré" translated by Thomas Johnson, London, 1642.

‡ Voyage dans la Grece, Paris, 1820.

§ Op. citata p. 584.

|| 11th Edition 1778, p. 38. Lond.

¶ In Gataker's translation of Le Dran's "Operative Surgery" with observations by

Mr. Lawrence, the celebrated surgeon of London, in a lecture which I heard him deliver on this subject in January, (1839), ascribed the first employment of whites of eggs and powdered chalk, as a solidifying mixture, to a namesake of his a Mr. Lawrence of Brighton, Eng. within a few years past; he recommended the practice very highly, and went through the process before his class of applying the apparatus. It has been in use for some months past at St. Bartholemew's Hospital.

Mr. Alfred Smee has lately published in the *Lond. Med. Gaz.* an account of certain "moulding tablets for fractures" consisting of a composition of gum arabic and whiting, interposed between two layers of coarse linen. These appear to possess very valuable qualities as splints, and are certainly equal if not superior to those made of felt soaked in gum shellac, which on account of their being patented by the inventor, are placed to a certain degree beyond the reach of the profession.\*

Lecat, a French surgeon, in the year 1735, in an essay on the treatment of fractures, to which a prize was awarded by the Royal Academy of Paris, makes the following assertion:—"A simple fracture when reduced, requires only to be maintained; and it need be examined but once before its consolidation, oftener is unnecessary." In 1768, M. Moscati, acting on these principles, presented to the notice of the "Academy" several cases of fracture which he had treated successfully by means of an apparatus, consisting of compresses and bandages saturated with the whites of eggs. The idea was again neglected, until resumed by Baron Larrey, in his well known apparatus employed with so much success after the battle of Moskwa;† this consisted of cushions and compresses, retained by the 18 tailed bandage, and rendered immovable by saturation with a mixture consisting of spirits of camphor, acetate of lead in solution, and whites of eggs; the apparatus thus applied remained undisturbed until the consolidation of the bones. Of its efficacy, and advantages, especially in military surgery, Larrey speaks in the highest terms.

The employment of plaster of paris, mingled with water and made to consolidate around a limb in order to render it immovable, which is generally in Europe ascribed to the celebrated Dieffenbach who made a very extensive use of it, was originally derived from the Moors of Spain,‡ and first brought

*Cheselden* p. 453, the latter surgeon recommends the same mixture for the cure of "contorted or club feet;" he also gives a case in which he applied it to a fracture of the fore arm which happened to a gentleman while travelling; he continued his journey, and at the end of forty days, the bandages were removed and the cure found perfect. At a much later period John Bell recommends the same materials to be used in similar circumstances—Vide "Principles of Surgery" p. 137 Amer. ed. N. Y. 1812.

\* For an account of the moulding tablets See *Med. Exam.* vol. ii, no. 14. from *Lond. Med. Gaz.*

† Larrey's European Campaigns.

‡ Eaton's Travels in Arabia.

into notice in Europe, by Prof. Kluge of Berlin, in 1829, and Drs. Muttray\* and Rauch, who wrote theses upon the subject. Before this, however, as early as 1819, Prof. Gibson of the University of Pennsylvania, had devised this method of treating fractures, &c., and had explained the manner of its application to his class.† It has been frequently tried both in Europe, and this country, but there are several serious objections to its use of which the most prominent is the extreme fragility of the plaster, thus to a great extent limiting the motion of the patient. I saw several cases of club-foot, which had been operated upon by section of the different tendons, retained thus in a plaster mould, in the Middlesex Hospital at London, under the care of Mr. Mayo.

In the year 1834, M. Seutin, Professor of Operative Surgery in the *University of Brussels*, and Surgeon of the "*Hôpital St. Pierre*," of that city, having under his care many of those wounded at the siege of Antwerp, made a fair trial of the apparatus of plaster; but he found that the material lost in tenacity what it gained in solidity; and that it was easily broken, thus losing its most important advantage, that of permitting progression and exercise.‡ He then employed that of Larrey, which possessed neither of these disadvantages; but he found in it others, viz:—its weight, the difficulty of always procuring its ingredients, and the trouble required in its subsequent removal. M. Seutin was thus led to search for some other material which would combine the firmness and efficacy of those used by Dieffenbach, and Larrey, and, at the same time, be free from their inconveniences. The substance in which he thought to find a combination of these qualities was starch. This he tried in various ways, and finally succeeded in applying it in such a manner as to satisfy his most sanguine expectations. The following is the manner of its application; take for example a simple fracture of the leg: the materials necessary are three or four ounces of starch, previously boiled; four common rollers, six yards in length each; and sufficient binder's board for four splints. After applying compresses wet with any discutient liquid, such as spirits of camphor, or Goulard water, to the part, a dry roller is passed from the toes to the patella, or above it according to the situation of the fracture, so as to form what is commonly termed the reversed spiral bandage; another of equal size is then applied from above downwards; the splints, previously cut and moistened, are now moulded to the limb, and the whole covered with a coat of starch; another roller is applied over the splints from below upwards, this is smeared with another coat of starch, and finally the remaining roller completes the apparatus. It is mostly necessary to place some charpie, or cotton, on each side of the

\* MUTTRAY.—*De cruribus fractis gypso liquefacto curandis*. Berlin, 1831.

† Strange as it may seem two English surgeons—Messrs. Beaumont and Sweeting, were contending a year or two since, for the honor of having first used the plaster to cure fractures; the latter gentleman speaks in the highest terms of his success.

‡ *British and Foreign Med. Review*, Oct. 1838, and this *Journal* for Feb. 1839, p. 481.

ankle, in order to fill up the hollow caused by the starting out of the *tendo Achillis*. Assistants are required to support the limb in a state of extension during the application of the apparatus, and as the roller commences at the root of the toes, and a portion of the heel is also left uncovered, this is effected without difficulty. The fact that the toes, and a part of the heel are not covered is important, as from these parts the surgeon may judge of the general state of the limb, without removing the apparatus for the purpose of inspection. Still greater firmness may be given to the bandage by additional rollers applied as already indicated, with alternate layers of starch; the time which must necessarily elapse before the whole becomes perfectly dried, varies from thirty to ninety hours. In a report\* of the trial of this apparatus, and of the success which attended its use in the New York City Hospital by Dr. Gould and several other surgeons of that place, its advantages over those in common use are enumerated as follows, viz:—1. Its accurate adaptation to the limb; 2. Its lightness and strength; 3. Its cheapness, and the facility with which it is obtained under all circumstances; 4. Its easy application; 5. It causes no ulceration either from friction, or confinement to bed; 6. The freedom of motion which it allows; and it obviates, lastly, all necessity of repeated adjustment.† It is well known that the starched bandages have been tried in most of our hospitals, and their general superiority is mostly acknowledged; still like all its predecessors, it has its faults; these are, the length of time required before the bandages become firm, and the want of support to which the part is subjected until the drying takes place; this latter objection which is seriously urged by some, will be seen hereafter to be, in most cases without foundation.‡ I have ascertained by experiment that a starched bandage of moderate thickness will not dry perfectly in less than 50 hours; by suspending the limb from a common cradle, or fracture bridge, after its application, by means of two or three small strips of bandage, paper being interposed to prevent their adhesion when dried, and by placing

\* New York Journal of Med. and Surg. July, 1839.

† In the Maryland Medical and Surgical Journal, January, 1840, there are two cases described by Dr. A. F. Dulin which he treated successfully with the immovable apparatus; in conclusion he observes:—"Hitherto the various objections adduced against this method of treatment have not from experience been found valid."

There is also in the same number a description of a case of fracture of the thigh in an infant successfully treated in the same manner by Prof. Horatio G. Jameson of Baltimore. This application of the apparatus supplies a void in surgical practice which has hitherto been in a great degree neglected.

‡ There have been several cases reported in the journals of late of unsuccessful results from the use of the starched bandage; one by Dr. Defer of Metz, (see this Journal for February, 1840, p. 460,) which was evidently caused by shameful neglect on the part of the surgeon who first applied it; and several others in the last Number of this Journal, p. 461. In these cases the want of success must be referred to its proper cause, whether existing in the apparatus itself, or in the manner in which it is applied, which latter is the more probable.

vessels containing hot water\* on each side of the limb,† so as to create a current of heated air which may have free access to all parts of the apparatus, it may be perfectly dried in twenty or twenty four hours and frequently sooner. The difficulty experienced in quickly drying this apparatus, led me partially to investigate the subject, and in a series of experiments which I tried with this view I found the following results: 1. By boiling the starch in a solution of acetate of lead, e. g.  $\frac{3}{4}$ ij to the pint, or stronger, instead of using pure water, that the resulting compound was equally tenacious, if not more so than the starch prepared in the usual way, and that it became dry in much less time, generally from 15 to 20 hours, and frequently sooner. In this experiment a slight excess of diluted acetic acid was added to the solution of the acetate of lead in order to prevent the formation of a subacetate of lead, on the volatilization of a portion of the original acetic acid by the boiling and the consequent decomposition which would occur, owing to the incompatibility of the subacetate with the starch. 2. By roasting a portion of dried starch for a short time at a heat of about 230° Fahrenheit, so as to very slightly discolor it, it was rendered soluble in cold water, as originally demonstrated by Caventou, this solution dried on a bandage much sooner than the ordinary one, but when dry it was much less tenacious, more fragile, scaly and brittle, this in fact appears to be identical with the substance which De Saussure originally denominated "*amyline*."‡ A solution of starch exposed to a temperature of 70° Fahrenheit, undergoes fermentation, and is resolved partially into its several proximate principles, among which are sugar, the above mentioned "*amyline*," and a gummy substance called "*dextrine*" of which I shall hereafter speak; to this probably its dried solution owes its firmness.

After the publication of the report of M. Seutin, in 1834, the first notice, as before mentioned which appeared on the subject, his system of treatment was tried by many of the surgeons of France and Belgium. Many modifications of different parts of the apparatus were attempted;—for instance that of M. Laugier, of Paris, who employs common stout wrapping paper cut in the form of the eighteen tailed bandage in place of cotton, or linen rollers;—of M. Lafarge de St. Emilion, who used a mixture of boiled starch with powdered plaster of Paris,‡ in place of the simple substance, and asserts its superiority;—the substitution of tin, zinc, leaden, and carved wooden splints for those of paste-board, &c. &c. Still the original mode of its application is generally employed.

\* In the hospitals of Paris these vessels are commonly made of pewter or brass of a flattened spheroidal form, with an aperture on the top closed by a screw containing a ring by which they may be carried; this simple arrangement is frequently very useful in cases where it is necessary to sustain the temperature of a part by artificial means.

† Annales de Chimie et de Phys. vol. xl, p. 193.

‡ According to the experiments of Mr. Alfred Smee, a mixture of plaster of Paris and white of eggs possesses no tenacity whatever, and crumbles into powder when dry, spontaneously. Op. cit.



Among the surgeons of Paris, who gave to the improvement of M. Seutin, the fullest and fairest trial, the celebrated Velpeau stands first. He was early convinced of its superiority, and employed it in numerous instances which were highly successful. So fully convinced was he that the great desideratum to be attained in the treatment of fractures, was as it were within his grasp, in the possession of an apparatus so near to perfection, that he devoted all his resources to the search for a remedy for its deficiencies. He instituted an inquiry amongst the chemists of the metropolis for a substance which could be substituted for the starch, and its faults, and in the course of this inquiry, he became acquainted with the results of the researches of M. Payen and M. Persoz, with regard to the chemical relations of *fecula*. The experiments of these gentlemen demonstrated that, by the action of the substance called "*diastase*" existing in all farinaceous plants, as a proximate principle, upon *fecula*, (which action takes place in the process of brewing malt liquors, where both these principles are present in the malt,) there results the separation of an entirely new substance from the *fecula*, to which they gave the name of "*dextrine*."\* From the properties said to be possessed by this *dextrine*, M. Velpeau thought proper to give it a trial; and the result of his experiment entirely fulfilled his anticipations; he found it to be precisely the substance which he required, and has since constantly employed it with increasing success in the immense field of practice which he enjoys, and the results of his experience are generally known to the profession. It is here necessary that I should give a description of the "*dextrine*," and of the manner of its application.

"*Dextrine*" so called from the peculiar influence which it exerts in the polarization of light, turning the refracted rays to the right more than any other substance known, is generally met with in the form of a yellowish white powder resembling the "*lycopodium*," though not possessing its color; its taste and odour are very much like those of the seeds of the common canteleup, or cucumber;† it is soluble to any extent in water either cold or warm; this solution is viscid, tenacious and translucent, and on the evapo-

\* The peculiar action of the "*diastase*," in this case of chemical decomposition depends upon what Berzelius terms the "*doctrine of presence*." Its presence merely determines the elimination of the *dextrine* from the *fecula* by the process called "*diastasis*" (from *διασταζω* to separate, which is merely a new name for a process which we can not comprehend,) hence the name of the substance "*diastase*." This property of "*diastasis*" is analogous to that possessed by certain substances to determine, by their "*presence*" alone, in a solution, a combination between other substances which would not otherwise unite, itself at the same time remaining unaltered; this property of causing combination is called by the distinguished chemist cited above—the property of "*catalysis*." See an interesting paper by Dr. Draper, "*On the Action of Presence*," in the No. of this Journal for Nov. 1837, p. 122.

† This resemblance is remarkably perfect, and it renders the supposition probable that the *dextrine* may exist in the melon family as a proximate principle in a distinct state; I have not before seen this resemblance remarked.

ration of the water, it is converted into a sort of varnish resembling glue, which is extremely firm, tough and unyielding, but is readily redissolved on the application of water. It is insoluble in alcohol. In powder it has to a considerable degree the feel of starch between the fingers, and when a portion is thrown on burning coals, or the flame of a lamp, it flashes more vividly than most other minutely divided combustible substances of a like nature.—According to Mr. Proctor when tested with the tincture of iodine it yields a vinous red or purple hue, differing essentially from that produced in a solution of starch by the same test, and thus disproving its identity with that substance.\*

Dextrine has been used to a considerable extent in commerce and manufactures, especially in Paris, and other parts of France, in the form of its watery solution with sugar, under the name of "*Sirap de Dextrine*," as a substitute for some simple syrups, and in the sophistication of others; it is also an ingredient in the French beer, as manufactured at Paris. The continued action of diluted sulphuric acid upon starch, at the boiling point, results in the production of this substance; by carrying the process still farther the whole amount of starch employed is converted into uncrystallizable sugar. It thus appears that "dextrine" is one of the proximate organic principles, entering into the composition of all amylaceous vegetables and plants, in combination with fecula, amidine, diastase, gum, &c., &c., analogous in its properties with many of them, but essentially differing from all;—that it exists wherever farinaceous plants are found, and may be obtained in a separate state with facility, and at little expense. It is sold in Paris, by the quantity, at the price of eight sous the pound. With regard to its practical application, the following is the manner in which M. Velpeau employs it.

For a fracture of the tibia, about  $\frac{3}{4}$ iv of the powder of dextrine are necessary; this is thoroughly moistened with spirits of camphor, which prevents it from caking when the water is added—as the powder is insoluble in alcohol and its particles are merely separated, so as to be equally acted upon by the water. The quantity of water should be sufficient to render the solution about the consistence of molasses. If properly prepared, and allowed to stand a few minutes before use, it forms a sirupy solution fit for immediate application.

In applying the apparatus to the leg, after reducing the fracture, a dry roller is passed from the toes to the knee; two splints cut from the common

\* Most writers on Organic Chemistry pass this substance without notice; Orfila in the 3d vol. of the "*Chimie Médicale*," gives a limited description of its chemical relations. p. 386.

It gives me pleasure to be able to refer for a more minute detail with regard to the "Dextrine", its mode of preparation &c., to an excellent paper entitled "Observations on Dextrine and Diastase" published in the *Am. Journ. of Pharmacy*—January, 1840, by Wm. Proctor, Jr. of this city.

binder's board, and previously moistened so as to mould themselves exactly to the inequalities of the limb, are then placed one on either side; these are smeared over with the mixture, and a second roller, thoroughly soaked in the solution, is applied over them, and afterwards perfectly covered externally by a coat of the varnish.\* The limb would then, in the case before us, be suspended from a fracture bridge, and surrounded by vessels of hot water, in the same manner as previously mentioned in the description of the starched bandage.

In this way the bandages in less than six hours, become so firm and hard as to sustain the limb more perfectly than the most complicated machines, and the patient may take exercise constantly, making use of crutches, and supporting the part by a stirrup of bandage passed around the neck, without the least danger of deranging the apparatus. In fact, patients at La Charité, with simple fracture, are frequently seen promenading the garden, in a day or two from their entrance, with perfect ease. When the period has elapsed which is necessary to the consolidation of the fracture, the apparatus is removed with the greatest facility, after soaking the part for a few minutes in water. In the use of dextrine in this manner, M. Velpeau has been gratified with the most perfect success. During a period of eight months of constant attendance in his wards, in which time upwards of fifty cases of fracture came under his care, I saw there no other apparatus but that of dextrine—and the bandage of Scultetus for immediate use in compound fractures. Part of the time I was actively engaged in his service, and had frequent opportunities of applying the apparatus under his inspection, and of closely watching its action during the whole progress of cure. Of its application to each particular case of fracture, luxation, &c., it would be useless to enter into a detailed description; the account which has already been given, will serve as a model for any that may occur. In any case where additional strength is required, the number of bandages of course must be increased.

In fractures of the lower extremities where extension and counter-extension become necessary, this is effected, as usual, by a bandage around the foot and ankle before the dextrine is applied, made fast to the foot of the bed, and the common strap beneath the perinæum, attached above. In luxations, the common bandage is merely soaked with the solution of dextrine, before its application. In sprains, or luxations, accompanied by severe straining, or laceration of the ligaments, this apparatus is particularly valuable, as it secures such perfect rest and immobility, which are indispensable to a favorable termination of the accident.† After the operation of *tenotomy*, or the cutting

\* A strip of stout binder's board soaked in a solution of dextrine, and dried, makes a very firm splint, and when moistened is easily adapted to any part of the body, where it may be retained by a simple bandage,—thus constituting a very simple and effectual support.

† In fractures of the clavicle, and luxations of the humerus, M. Velpeau employs a

of the tendons for the cure of club-foot, there is no machine so generally useful, or so easy of access as the *immovable apparatus*. M. Velpeau employed it with the most perfect success in five cases, on which he operated whilst I was in his service; in one of these cases there were five tendons divided, and subsequently two more. It was also his very common practice to order its application to diseased joints, particularly in those cases where there exists a fungous state of the synovial membrane, which is so common a variety of the white-swelling, and in which, after the failure of the usual antiphlogistic treatment, perfect rest conjoined with compression is the only effectual resource. In articular effusions, especially of a chronic character, where immobility, united with pressure, is so useful in promoting absorption; in coxalgia, and the different varieties of diseased joints requiring rest and support, the immovable apparatus has been employed with very favorable results. In the "*phlegmasia alba dolens*" it has occurred to me that a regularly applied pressure to the whole limb, by means of this, or the simple bandage, united with the elevated position, would form a very good means of subduing this disease, which is by no means under the control of our art. I have had however the opportunity of applying this treatment but to one case. In this instance the limb was excessively painful, the slightest motion causing the patient to cry out with the suffering; the *dextrine* bandage was applied in the evening, and the limb elevated; this was the fourth day of the disease. On the next morning the œdematous effusion had considerably decreased, the patient suffered no more pain, and the recovery advanced with unusual rapidity.\*

In the treatment of varicose veins, for the cure of which the operation of excision, and the obliteration of the vein by means of pins, and ligatures, have proved, at best, such dangerous remedies, the immovable bandage offers

peculiar bandage of his own; which is well known—this however is objectionable as it always brings the elbow forward, whatever may be the situation of the fracture, or the relation of the broken extremities; this he applies after merely soaking the roller in dextrine dissolved.

\* In the "*London Medical Gazette*," of June last, is published a clinical lecture delivered at the Westminster Hospital by Dr. Burns, in which he maintains that this disease consists in a *phlebitis* of the leg caused by the pressure of the pregnant uterus upon the common iliac veins; and that the left leg is more commonly affected than the right, owing to the fact that the left iliac vein when it reposes on the last lumbar vertebra is crossed by the common iliac artery, and is thus subjected to a double pressure, the arrangement not being the same on the right side. He confirms this idea by the citation of 20 cases described by Linn, Davis and Velpeau, in which number the right leg was affected in one case, both legs in 6, and in the remaining 13 the left alone. This explanation is rendered plausible when we remember that the "noise of the placenta," as it was formerly called, the "*bruit placentaire*" of Bouillaud, is ascribed by him to the pressure of the uterus upon the hypogastric arteries, and that this fact is now generally admitted by physiologists: If these ideas are correct, the pathology of the disease would indicate a treatment similar to that mentioned above, consisting of pressure and elevation of the limb.

a valuable substitute for the laced stocking, &c., at least in hospital practice.

Having now mentioned all the peculiarities of the improvement of M. Velpeau, the ensuing remarks will apply equally to the starched apparatus, and that of dextrine,\* for it will be perceived that the one is but an improvement on the other, and that many advantages are possessed in common by both.

With regard to the application of this apparatus to the treatment of compound, and comminuted fractures, I have not as yet spoken. By surgeons of high authority who have given to it a fair trial, contradictory opinions have been expressed. The common practice of M. Velpeau is to apply at first the bandage of Scultetus, and to continue this until the external wound is in a favorable state for healing, when the dextrine is applied without delay; while the bandages are still wet, a hole is cut out immediately over the wound† so as to allow free access to it, and it is dressed daily. Of late M. Velpeau has been gradually growing more partial to the immediate application of the dextrine, in despite of the inflammation and tumefaction of the part, and he does not hesitate to defend this practice in public, in which he is sustained by Larrey, Gimelle, and some others.‡

\* It may be proper to remark that M. Velpeau objects to the term "appareil inamovible," (immovable apparatus,) which is generally applied to this bandage; Larrey, however, whom the French consider as its original inventor, approves of the term, as also does Seutin. I have used the phrase indifferently as it will be perceived, applying it both to the dextrine and the starch.

† This expedient was resorted to by Dieffenbach in his plaster apparatus, and according to M. Sedillot was also employed by the Arabs in their immovable splints consisting of split reeds and sheepskin.—*Gazette Medicale*.

‡ In order that there may be no misunderstanding on this point, I will quote the words of Velpeau, in some remarks which he made at the Academie Royal de Medecine, on the sitting of August 5th, 1839; published in the *Gazette Médicale* of August 10th 1839.—  
 "Je me suis beaucoup occupé du traitement des fractures; j'ai traité un grand nombre de malades depuis l'époque où j'ai commencé à en faire l'application, puisque je pourrais citer maintenant plus de 150 observations; j'ai donc quelques résultats intéressants à présenter à l'Académie. Je ne crois pas qu'il y a de danger dans l'application immédiate du bandage inamovible; s'il n'y a pas d'engorgement, ce moyen en prévient le développement; s'il y a déjà de la tuméfaction, et que la compression soit bien faite, elle disparaît; rien n'empêche d'enlever l'appareil dans le cas où il produirait de la douleur, ou pourrait amener des accidens. \* \* \* \* Dans les faits qui se sont passés sous mes yeux, la compression qu'il exerce m'a paru toujours fort avantageuse pour dissiper la tuméfaction; il a passé rarement à l'état de suppuration. \* \* \* \* Je n'ai pas vu une seule fois dans le nombre des faits que j'ai observés, survenir des accidens qui, avec quelque raison, puissent être attribués au bandage. \* \* \* \*

"S'il doit être enlevé, et renouvelé, on le ramollit en l'humectant; rien n'est plus facile." L'appareil de dextrine durcit avec une grande rapidité; il suffit de quelques heures, au lieu de trois jours qu'exigeait le bandage de M. Seutin. \* \* J'ajouterai qu'il est facile, en surveillant attentivement le développement des douleurs, en consultant la teinte du membre, l'apparition de phlyctènes, &c., de savoir au juste quand il faut d'enlever l'appareil."

The application of compression by bandaging, as a direct means of subduing inflammation, has been strongly advocated in this country, by Prof. Dudley, of Kentucky, and his experience coincides with that of Velpeau.\*

Thus Suetin and Velpeau, who have had the greatest experience on the subject, agree in applying the bandages immediately; they are supported by Larrey, Gimelle and Berard, who cite thirty cases treated in this manner. On the other hand MM. Blandin, Breschet, Gerdy, and some others differ on this point, but their experience is more limited. There exists also a difference of opinion with regard to allowing the patient to take exercise; Suetin, and his partizans above cited, recommend exercise on crutches, with the limb supported wholly, or partially, by a stirrup from the neck; Blandin, Breschet, Amussat, and some others object to this practice, considering that it favours the formation of false articulations. All concur, however, in recommending the plan of making openings in the bandages opposite to external wounds, an expedient which it appears was adopted by the ancients, as it is explained, and figured in the work of Scultetus, and noticed in other authors.

It now remains for me but to discuss the objections, which have been urged against the employment of the "immovable apparatus," and to enumerate the advantages which it possesses, whether composed of starch or dextrine, over those commonly in use. It has been objected to the apparatus of starched bandages, that the limb to which it is applied is destitute of support until the bandages are dry, which requires from 30 to 96 hours. But it is not within the first two or three days, that displacement of the fractured extremities is to be feared; at a later period, when some degree of motion is allowed, there may be danger of its occurrence. The starched bandage while still wet is very nearly as firm as the ordinary apparatus, and if there be any fear of trusting to it alone, the expedient of Amussat may be resorted to, viz:—the application of a wooden, or metallic splint to the outside of the bandage until it is dried. This objection, however, cannot be urged against the dextrine, as it can be dried in three or four hours. Again it is said that when applied upon a tumefied limb, the swelling when it subsides may leave the bandage too large; when this takes place to a considerable degree the apparatus must be renewed; than this nothing is easier to effect, as the same bandages may be reapplied; when the disproportion is inconsiderable it may be remedied by stuffing charpie, or carded cotton into the crevices of the apparatus.

In a case of fracture of the tibia and fibula, treated successfully by the starched bandage at the Pennsylvania Hospital, by Dr. Thos. Harris, this inconvenience was satisfactorily remedied, by applying a bandage over the apparatus at an advanced period of the cure, which by compression, obliterate

\* Vide "Transylvania Journal of Medicine." vol. i, No. 9, November, 1828.

ted the disproportion between it, and the limb, which had become somewhat shrunken from atrophy of the muscles.\*

Drs. Christophers and King, in several instances in which they used Seutin's bandage, successfully adopted the expedient of slitting it down in several places, and surrounding it by two or three gum elastic straps.† Some have expressed great fears that the compression thus effected by applying a firm bandage to a swelled limb, would cause strangulation, and subsequent gangrene; but these fears are unfounded, as daily practice proves to the contrary; in fact we do not strangle the limb in thus applying the apparatus; compression is effected with regularity from below, upwards, and experience shows, that far from inducing injurious consequences, it produces the most beneficial results.‡ Compression regularly applied to a healthy limb would produce atrophy, not gangrene; and on a swelled and inflamed part it reduces the inflammation, and if we are to credit the results of Velpeau's experiments, it produces effects almost like those of enchantment. He commenced its use with the same ungrounded fears of strangulation and all its consequences; but the results of reiterated experiments dispelled his doubts, and confirmed him in that practice which he now so strenuously advocates.

Another disadvantage attributed to this method, is that we are left in the dark so entirely as to the state of the limb, that we can no tascertain whether there exist eschars, abscess, or any other complications. Now if only moderate attention be employed, none of the accidents need occur; they must produce pain, and general symptoms, and then the bandage may be removed: as regards strangulation too, the extremities of the toes and the heel remaining uncovered, give timely notice of the approach of gangrene.‡ With regard to the confinement of pus, by the application of the bandage to cases complicated with wounds of the integuments, experience has proved that it does not give rise to those pernicious results too generally apprehended; the pus is not decomposed by the contact of the air, and infiltration of the integuments rarely takes place.—The formation of psuedo-arthroses, or false articulations, an objection so much dwelt upon by the opposers of this plan of treatment, is ever the result of carelessness, and want of judgment on the part of the practitioner, or of other obvious causes, and the immovable bandage is no more liable to induce such consequences than is any other apparatus inefficiently applied. At all events these objections can not be urged against its employment in luxations, sprains, club-foot, diseases of the joints &c., &c.

\* *Med. Exam.* vol. ii. No. 9, where there are reported five other cases treated with success, by the same surgeon at the Pennsylvania Hospital, after the method of Seutin;—three of these were oblique fractures of the femur which were cured without perceptible deformity. In all these cases more or less exercise was allowed during the cure.

† *London Med. Gaz.* Aug. 11th, 1839.

‡ *Brit. and For. Med. Review*, Oct. 1838, and this *Journal* for Feb. 1839, p. 483.

But by far the most powerful arguments which can be brought forward in support of this method of practice, are the undoubted results of experience. Seutin with his 200 cases, and his distinguished success, has passed with triumph the critical ordeal, and severe scrutiny of the French surgeons, ever so distrustful of foreign improvements, and modern innovations; and has succeeded in convincing them of the efficacy of his treatment, and in substituting it to a great extent for their own. Larrey, Velpeau and Blandin, the committee of the *Royal Academy of Medicine* of Paris, the authority of the French capital, and the arbiters of surgical practice, after a patient investigation of the subject, report in the most favourable and even enthusiastic terms their conviction of its superiority, and each adds his personal testimony as additional tribute.\*

In addition we have the testimony of the cautious Breschet, of Amussat, Bernard, Rochoux, Gimelle, Emery, Laugier and Lafargue, who have each tried thoroughly the experiment, and unite in confirming its success. The anticipations of Cheselden have been realized; and the approval of Lawrence has been more than confirmed.—The British and Foreign Medical Review† in the early part of the present year, contained a review of some length, in which the subject is discussed at large, and the employment of the immovable apparatus meets with the most hearty approval; the objections to its use are ably refuted, and its superiority fully asserted; the learned reviewer in conclusion remarks: “To those persons who are unconvinced by our statements, we would say, make the experiment yourselves; make it fairly and without prejudice; and do not pronounce judgment without having experimentally tested its correctness.”

In so limited an essay as the nature of the present paper requires that it should be, we can but glance at the immense advantages which must accrue to the physician, as well as to the patient, on the introduction of the immovable apparatus into general use, in its convenience and economy in military and naval surgery, in hospital practice at large, and amongst the poor;—to the traveller whom an accident can no longer delay in the prosecution of his journey;—to the tradesman who in many cases may continue his occupation, if a sedentary one, with a fractured limb. There are no painful excoriations, nor tedious ulcerations to torment the bed-ridden patient in his monotonous and wearisome confinement;—to irritate the constitution, and drag down the health, which is so often, and so severely affected.

In the public practice of M. Seutin, it is reported that on each occasion the bandage has been promptly applied, and the patient has been in the greater number of cases, raised up and placed on crutches as soon as the bandages were thoroughly dried. Persons have proceeded on their journeys at the end of three days from the application of the apparatus. Those

\* For their Report and several opinions, see *Gaz. Médicale de Paris* of August 10th 1839.

† In a critique upon the works of Burke and Lonsdale on Fractures, Feb. 1839.



living in town, with simple fracture, are bandaged, looked after for four or five days, and then discharged; at the end of five or six weeks they come again to the hospital; the apparatus is removed, and they are found cured, and ready to return to their usual occupations.

In conclusion I can do no better, than repeat the words of Velpeau, to whose enterprise and industry the profession is already so largely indebted: "Ce qui m'étonne, c'est que ce bandage ne soit pas plus généralisé encore dans son emploi; il est si simple, si facile, et présente tant d'avantages, et si peu d'inconvéniens, que je ne comprend pas les reproches qu'on pourrait lui adresser."

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ART. V. *Statistics of the Amputations of Large Limbs that have been performed at the Massachusetts General Hospital; with Remarks.* By GEO. HAYWARD, M. D., one of the Surgeons to the Hospital.

THE following table, it is believed, contains a list of all the amputations of large limbs that have been performed at the Massachusetts General Hospital since the establishment of that institution. Such particulars are added as were thought calculated to throw light on the subject. These in a few instances are not so full perhaps as could be wished.

This remark applies especially to some of the early cases, which occurred at a period when the records of the hospital were not kept with that precision that has since been adopted. The omissions, however, are not thought to be such as will impair to any extent the value of the table.

The statistics of amputation are very desirable. They may probably lead to practical results of some importance. From what has recently been published, it is evident that amputation is more often followed by the death of the patient, than was formerly supposed. But to what extent this can be attributed to the operation itself, or to the disease or injury for which it was performed, cannot be precisely determined.

It has been stated, that more than one-half of all whose limbs are amputated at some of the hospitals of Paris, die; and it appears, from a very valuable paper published by Dr. Norris in the Number of this Journal for August, 1838, that of fifty-five patients, being the whole number on whom amputation was performed in the Pennsylvania Hospital during a period of eight years, twenty-one died.

And yet, these unfavorable results cannot fairly be attributed to the operation alone. There are a variety of causes that would exert a bad influence in the hospitals of Paris, that are not to be met with in those of our country. The former are more crowded, less comfortable, and badly ventilated in